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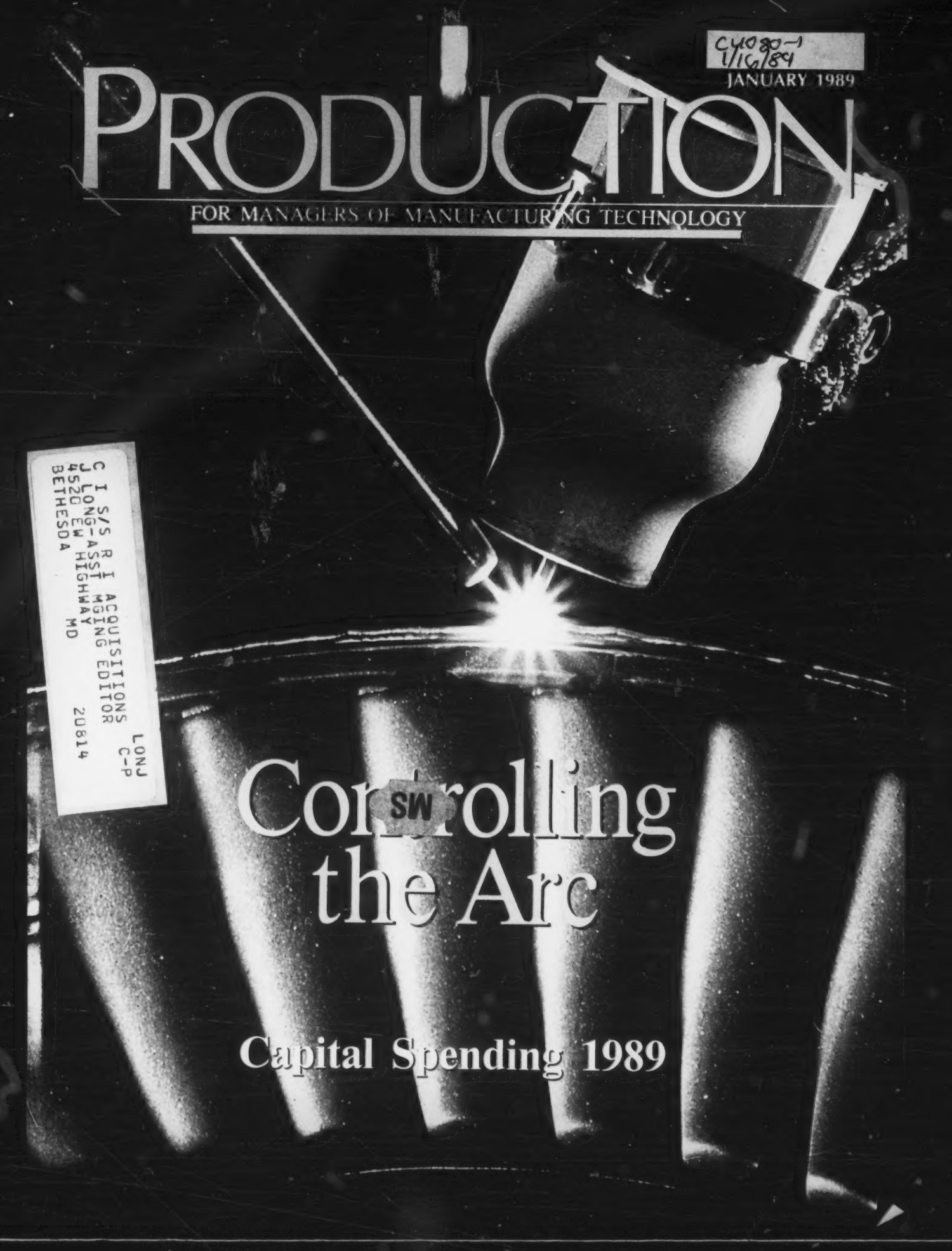
FOR MANAGERS OF MANUFACTURING TECHNOLOGY



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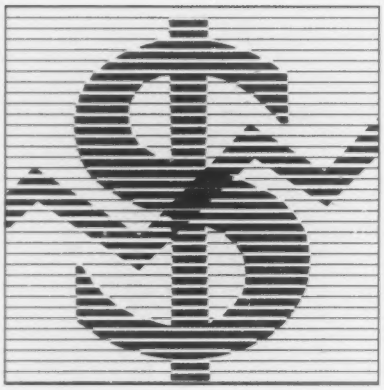
Controlling the Arc

Capital Spending 1989

JANUARY 1989

PRODUCTION
COVER-TO-COVER

VOL. 101 NO. 1



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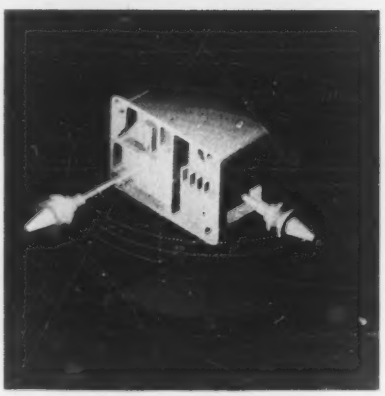

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About the cover: The Dabber arc-welding system from the Hobart Brothers Co. (Troy, OH) is shown rebuilding a knife-edge seal on the fourth-stage rotor turbine assembly of a jet engine. The computer-controlled TIG process throws minimal heat into the metal, allowing deposition of several thin layers of weld material to rebuild the part edge without part distortion.

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Capital Spending 1989: America Bounces Back

The Rust Belt is getting a brand-new, highly polished finish in the form of increased amounts of machinery and equipment. It may have been down, but certainly not out. And it looks like it's back—with a vengeance.

By Edward D. McCallum, Jr., *Vice President, Indumar Inc.**
and Gary S. Vasilash, *Executive Editor*

THE BOTTOM LINE IS BIGGER THIS year. According to the PRODUCTION 1989 Capital Spending Survey,** spending on machinery and equipment (not bricks, mortar and real estate) will be up 11.1 percent over 1988, to an adjusted total of $9.91 billion, up from $8.79 billion. There is optimism in American manufacturing. But it's optimism based on something solid: 49.7 percent of the companies report that incoming orders are increasing. Only 5.5 percent note a decrease.

What's more, in the July-August 1988 period during which this survey was conducted, plants reported that they were operating at 79.6 percent of capacity, up from 77 percent in the same period a year previous.

The point is, this isn't a phenomenon that is restricted in scope to 1989. In fact, the companies as a group spent more money in 1988 than they had planned to: 105 percent of their original estimations. One very big spender (it expects to invest $850 million this year) spent 115 percent of its intended 1988 budget. This is despite the October 1987 stockmarket crash that some observers said would put the brakes on capital investments.

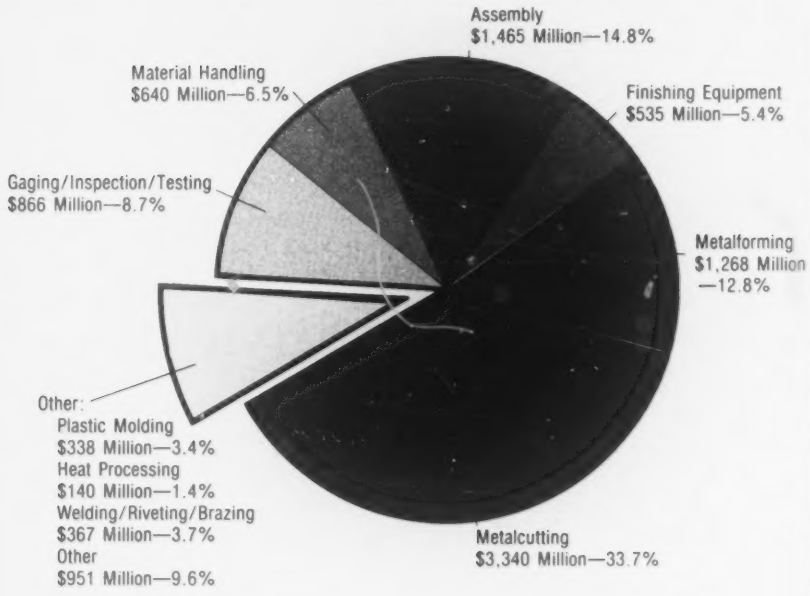
Boost to domestic builders. The dollar-yen relationship gives a boost to builders of American equipment, that and the fact that the Japanese seem to be refortifying their production infrastructure, which means that they are absorbing machinery and equipment, products which might otherwise be destined for U.S. shores.

Some companies are beginning to realize that in order to use manufacturing as a competitive weapon they need to increase their amount of spending on new machinery and equipment. Given the predominant power of the financial people in

**Note: This is the 21st time that Ed McCallum has conducted the PRODUCTION Capital Spending Survey. He has done it both as an employee of PRODUCTION Magazine and as a consultant. Indumar is a Cincinnati-based industrial market research firm. McCallum specializes in manufacturing technologies.*

***The information for this survey is a result of sending questionnaires to PRODUCTION readers in 10,000 different plants. Of the total, 6,000 went to plants employing over 250 people. The remaining 4,000 were selected on an Nth plant basis of facilities with fewer than 250 people. All of the plants were in one of the following Standard Industry Classification (SIC) groupings: SIC 34, Fabricated Metal Products; SIC 35, Machinery, except electrical; SIC 36, Electrical Machinery; SIC 37, Transportation Equipment; SIC 38, Instruments. Additionally, some plants in the Metal Furniture category of SIC 25 received the survey. Of the total 10,000, 3,094 questionnaires were determined useable.*

1989 Capital Equipment Spending Projections by Type of Equipment



spending, this realization can be interpreted from the required minimum pre-tax, first-year, return-on-investment (ROI). Although the average is 30.5 percent for the total number of respondents, approximately half of the respondents say that the ROI is just 15.8 percent. Which means that many companies are being encouraged to spend money. (One big non-automotive manufacturer that is being pressed by off-shore competition has relaxed its first year ROI to less than 10 percent, recognizing the necessity of having productive equipment in place without having undue worry about achieving a rapid return. After all, the alternative could be no returns, period.)

The big spend big—and early. The money is where the money always has been. In the coffers of the big plants. That is, in plants with fewer than 20 employees, the expected median 1989 investment in plant and equipment is $75,000. That figure is more than tripled—goes to $250,000—for plants with from 100 to 249 employees. There's a jump to $550,000 for plants with 250 to 499 people, and in plants with from 500 to 2,499, the planned per plant expenditure is $1,750,000. At the top, the plants with 2,500 or more employees, the median spending figure is $2,500,000. (More than half of the 3,094 valid responses came from plants with employment ranging from 100 to 499 people [41 percent] and from 500 to 999 [14.7 percent].)

And the monies they've designated for capital equipment spending in 1989 is well on its way to the builders of machinery and equipment. Some of it has been there for six months already. That is, approximately one-third of the respondents had placed 50 percent or more of their 1989 orders in the summer of 1988. (The average plant placed 12 percent of budget; the median was 25 percent.)*

Which leads us to suspect that it's possible that the deeper well for 1989 may run dry fairly quickly. And that borrowing into 1990's funds could occur, which could setup a skewed spending pattern.

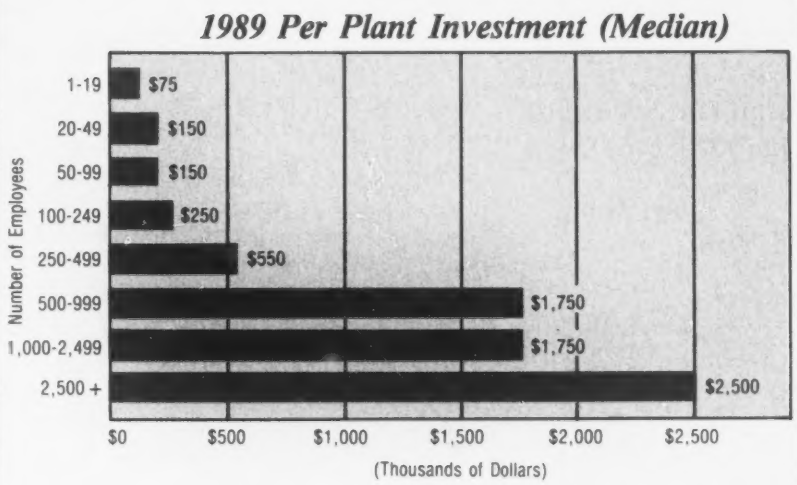
Capacity crunch? However, there is something that could mollify that trend. The U.S. machine tool building capacity has, over the past several years, been shrinking. Companies have gone out of business. Companies are going out of business. Companies are becoming consolidated with other companies, which often means that *x* capacity and *y* capacity are becoming *x* minus *y* capacity.

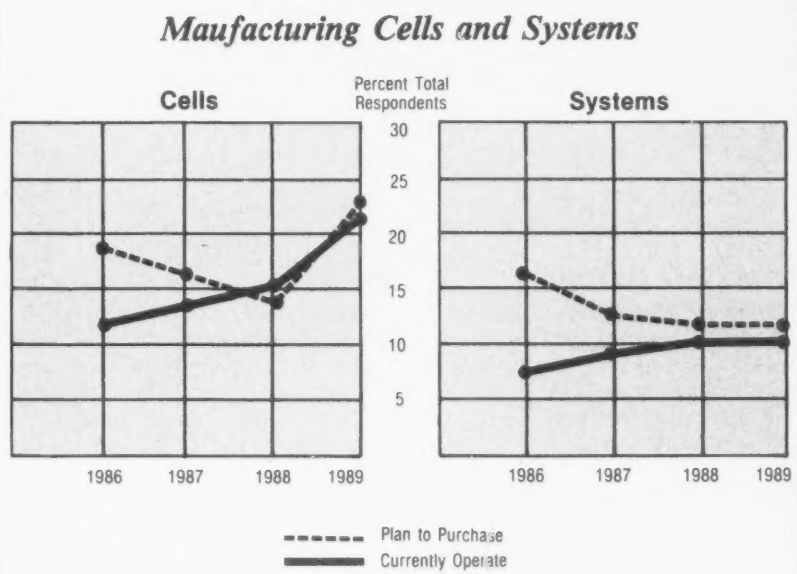
It could be that some companies spent a portion of their monies ahead of the calendar year so that they were able to get good places in line, as orders are getting strung out in these rapidly filling capacities.

If business continues at a good level, then the issue of deliveries may become of key importance.

The survey shows that domestic production equipment builders will receive 72 percent of the business and 18 percent will be foreign sourced. It should be noted that this is the first time that foreign equipment sourcing has dropped below 20 percent since 1985 (17 percent), after peaking in 1988 at 29 percent. However, domestic metalcutting and metalforming equipment manufacturers cannot afford to be too sanguine. Off-shore equipment will still be coming in at a hefty rate, although somewhat weakened. For example, metalcutting sourcing has been about 50-50, domestic and off-shore, during the past few years. Last year the domestic total was up to about 70 percent. Although there are Voluntary Restraint Agreements (VRAs) in place that are to protect American builders, due to

**Note: Not everyone had their money at the time of the survey. But those awaiting approval expected to receive 91 percent of that they wanted, which is the highest figure reported to date.*





machine tool demand in Japan, they really haven't been tested.

There are three primary factors behind off-shore sourcing: equipment quality, features, and price. Since 1985 the issue of service has been creeping up, from 10.5 to 19.4 percent. It's expected that the issue of service will grow as the population of foreign equipment rises in the U.S.

Addressing assembly labor. Once again, direct labor stands as the number-one reason for investment in capital equipment, with 65.9 percent of the respondents indicating that that's one of their motivators. Although this may seem somewhat peculiar, given that the direct labor in manufacturing is approximately 10 percent of overall cost, there is a growing area, which is assembly. The survey shows that although metalcutting remains the number-one area of investment, $3,340,000,000, or 33.7 percent of the total, assembly has jumped 41 percent over last year, and is now in the number-two spot. That is, in 1988 $1,030,000,000 was slated for assembly investment; the number is $1,465,000,000 in 1989.

What's more, in the areas of flexible cells and flexible systems, assembly is very strong. In fact, in systems, assembly ranks as the primary function in 45.6 percent of the cases. Metalcutting is number two, at 40.7 percent. Although metalcutting is number one in flexible cells, its margin over assembly is slim: 46.8 percent to 42.8 percent.

The point is, assembly is a very labor-intensive operation. These spending patterns indicate that efforts are being made to change that.

Other investment reasons, such as material costs, in-process inventory, and indirect labor remain substantially stable. But one big jump, from 32.9 percent in 1988 to 42.1 percent in 1989 is scrap and rework. Waste is clearly on the way out. This observation is further substantiated by an increase in spending in the gaging-inspection-testing category. Last year, $694 million, or 7.9 percent of the total capital spending pie, was that category's slice. This year, the slice is bigger, measuring 8.7 percent of the total, or $866 million.

Cells strengthen; systems fade. Returning to cells, it's worth noting that they are being embraced by more companies than ever before. In the 1988 survey, 14.9 percent reported that they operated cells (defined as "one materials handling device servicing multiple machines which are coordinated and paced by a computer or programmable controller"). In 1989's, 21.8 percent indicate that they currently operate cells.

And there are more to come. Between 1989 and 1991, 23 percent plan to purchase cells. This can be compared with 14.4 percent who said that they planned to buy between 1988 and 1990.

Systems don't fare nearly as well. In fact, the number of companies

reporting system operations dropped 0.3 percent in 1989 from 1988. Those planning to purchase a system during the next three years are 11.6 percent, which is up just 0.4 percent from a year ago.

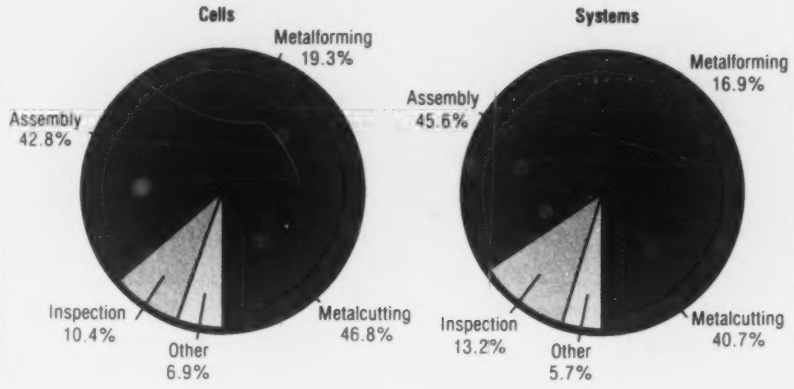
The numerical control/computer numerical control (NC/CNC) arena is probably nearing its maximum. 66.9 percent of the respondents say that they use NC/CNC equipment. About 70 percent will probably be a maximum. The average number of controlled machines is six per plant. 53.9 percent of the respondents plan to buy more within the next three years.

Computer use is rising, up to 82.7 percent versus 73.4 percent in 1988. And 66.8 percent plan to add additional manufacturing software in the next three years. The top five software applications are: computer-aided design (CAD), production control, NC/CNC programming, inspection/quality control, and MRP/MRP II.

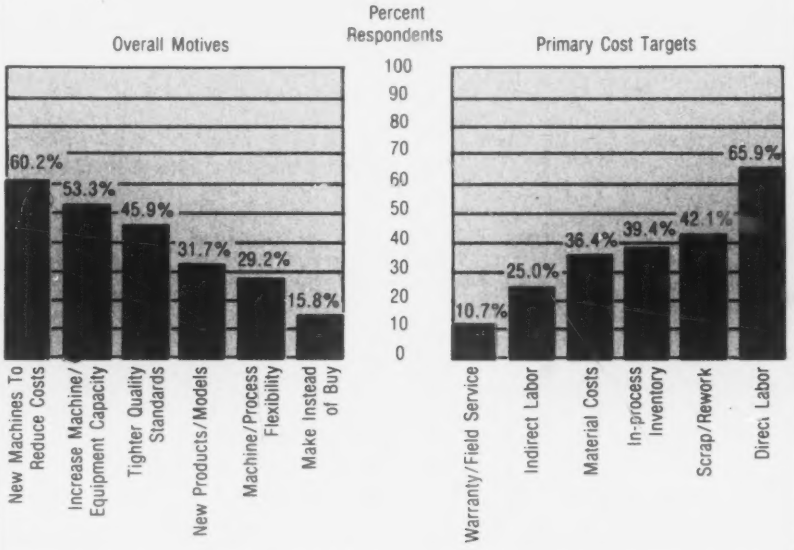
High-tech is limp. With regard to what some consider the more "advanced" or "nontraditional" technologies, things remain slow. Just 22.8 percent say that they use electrical discharge machining (EDM) equipment; only 9.2 percent plan to buy any during the next three years.

Lasers do somewhat better, with 13.1 percent of the respondents planning to purchase lasers. With regard to applications, 46 percent indicate gaging-measurement; 36.6 percent note cutting; welding, drilling and heat treating are 20.9, 14.1 and 5.2 percent, respectively. There is an apparent anomaly in that although gaging-measurement ranks as number one, helium-neon lasers, the type used for that process, ranks three out of three in application (i.e., 15.9 percent, compared with 24.6 percent for CO_2 and 17.2 for Nd:YAG). However, this may be that a company would use fewer helium-neon lasers for, say, alignment than it would need for production cutting or welding, operations which can be performed with CO_2 and Nd:YAG lasers.

Primary Functions for Cells and Systems To Be Purchased 1989-91



1989 Capital Investments



Robotics continues on its anemic path. In 1985, 36.9 percent reported that they were using robots. The 1989 survey has 24.3 percent using them. And five years ago, 33 percent of the plants indicated that they planned to buy robotic devices. This has fallen to 21.7 percent in the 1989-1991 time frame. The perennial number-one use is machine load/unload. Just two percentage points separate it from number-two, assembly, which relates back to the earlier emphasis on putting things together.

In fact, "putting things together" just may be the appropriate image for what is happening in American industry today.

The following pages show 1989 spending patterns (by SIC) based on the results of PRODUCTION's Capital Spending Survey.

Spending Patterns

For each of the nine production equipment categories listed, the industries cited are those that account for at least 75% of the planned 1989 investments for that particular type of equipment. Industries not listed do not make significant investments in equipment of that type. Comparing your company's investment plans with your industry is simple. Determine the amounts, by percentage, of total capital expenditures budgeted for each of the equipment categories. Then compare those amounts with the listings.

Cleaning and Finishing Equipment

The average respondent company will allocate 5.4% of total investment to cleaning and finishing equipment.

SIC	Industry	% of Total Capital Expenditures
251	Household furniture	10.7
252	Office furniture	15.2
253	Public building and related furniture	7.5
254	Partitions, shelving, lockers, and office store fixtures	16.6
259	Miscellaneous furniture and fixtures	7.2
341	Metal cans and shipping containers	7.6
342	Cutlery, handtools, hardware	7.7
343	Heating equipment, except electric and warm air; and plumbing fixtures	11.7
344	Fabricated structural metal products	9.3
347	Coating, engraving, and allied services	49.2
352	Farm and garden machinery and equipment	13.5
358	Refrigeration and service industry machinery	5.9
361	Electrical transmission and distribution equipment	6.7
363	Household appliances	8.0
364	Electric lighting and wiring equipment	7.4
365	Radio and TV receiving equipment, except communication types	6.0
371	Motor vehicles, motor vehicle equipment	7.2
375	Motorcycles, bicycles and parts	18.3

Assembly Machines/Equipment

The average respondent company will allocate 14.8% of total investment to assembly machines/equipment.

SIC	Industry	% of Total Capital Expenditures
342	Cutlery, handtools, hardware	17.6
348	Ordnance and accessories, except vehicles and guided missiles	16.0
357	Office computing and accounting machines	33.0
358	Refrigeration and service industry machinery	17.5
361	Electrical transmission and distribution equipment	18.6
362	Electrical industrial apparatus	20.3
363	Household appliances	18.2
364	Electrical lighting and wiring devices	26.1
365	Radio and TV receiving equipment, except communication types	30.1
366	Communications equipment	29.1
367	Electronic components and accessories	28.9
369	Miscellaneous electrical machinery, equipment and supplies	37.5
371	Motor vehicles, motor vehicle equipment	19.5
374	Railroad equipment	18.8
375	Motorcycles, bicycles and parts	21.7
382	Measuring and controlling instruments	23.0
383	Optical instruments and lenses	16.3
384	Surgical, medical and dental instruments and supplies	24.9
386	Photographic equipment and supplies	21.5
387	Watches, clocks, clockwork-operated devices, and parts	44.3

Welding/Riveting/Brazing Equipment

The average respondent company will allocate 3.7% of total investment to welding/riveting/brazing equipment.

SIC	Industry	% of Total Capital Expenditures
252	Office furniture	9.2
253	Public building and related furniture	12.5
254	Partitions, shelving, lockers and office and store fixtures	7.9
259	Miscellaneous furniture and fixtures	13.3
341	Metal cans and shipping containers	3.4
343	Heating equipment, except electric and warm air; and plumbing fixtures	7.4
344	Fabricated structural steel products	10.6
349	Miscellaneous fabricated metal products	4.8
351	Engines and turbines	5.7
352	Farm and garden machinery and equipment	3.9
353	Construction, mining and material handling machinery and equipment	6.1
355	Special industry machinery	4.7
358	Refrigeration and service industry machinery	5.3

361	Electrical transmission and distribution equipment	6.5
363	Household appliances	3.2
371	Motor vehicle, motor vehicle equipment	5.4
373	Ship and boat building and repairing	3.8
374	Railroad equipment	18.9
375	Motorcycles, bicycles and parts	10.0
379	Miscellaneous transportation equipment	10.0

Material Handling Equipment

The average respondent company will allocate 6.5% of total investment to material handling equipment.

SIC	Industry	% of Total Capital Expenditures
251	Household furniture	13.7
252	Office furniture	13.8
253	Public building and related furniture	21.3
341	Metal cans and shipping containers	11.6
342	Cutlery, handtools, hardware	7.1
343	Heating equipment, except electric and warm air; and plumbing fixtures	7.4
344	Fabricated structural metal products	7.7
347	Coating, engraving and allied services	7.1
349	Miscellaneous fabricated metal products	6.4
352	Farm and garden machinery and equipment	6.8
353	Construction, mining, oil field and material handling equipment	8.4
357	Office, computing and accounting machines	11.2
358	Refrigeration and service industry machinery	8.6
361	Electrical transmission and distribution equipment	7.7
363	Household appliances	8.6
364	Electrical lighting and wiring equipment	9.9
365	Radio and TV receiving equipment, except communications types	11.9
366	Communications equipment	8.5
367	Electronic components and accessories	7.1
369	Miscellaneous electrical machinery, equipment and supplies	7.8
371	Motor vehicles, motor vehicle equipment	9.5
374	Railroad equipment	8.1
376	Guided missiles and space vehicles and parts	12.1
379	Miscellaneous transportation equipment	7.1
381	Engineering, laboratory, scientific and research instruments and equipment	7.3
386	Photographic equipment and supplies	6.7

Metalforming Machinery/ Equipment

The average respondent company will allocate 12.8% of total investment to assembly machines/equipment.

SIC	Industry	% of Total Capital Expenditures
251	Household furniture	28.1
252	Office furniture	41.6
253	Public building and related furniture	28.8
254	Partitions, shelving, lockers, and office and store fixtures	27.1
259	Miscellaneous furniture and fixtures	22.2
341	Metal cans and shipping containers	26.9
342	Cutlery, handtools, hardware	16.7
343	Heating equipment, except electric and warm air; and plumbing fixtures	25.2
344	Fabricated structural steel products	24.9
345	Screw machine products	17.9
346	Metal forgings and stampings	42.6
352	Farm and garden machinery and equipment	24.5
353	Construction, mining and material handling machinery and equipment	15.1
358	Refrigeration and service industry machinery	34.5
361	Electrical transmission and distribution equipment	15.8
363	Household appliances	30.5
364	Electrical lighting and wiring equipment	14.9
371	Motor vehicles, motor vehicle equipment	11.9
373	Ship and boat building and repairing	17.7
374	Railroad equipment	13.8
386	Photographic equipment and supplies	14.8

Gaging/Inspection/Testing Equipment

The average respondent company will allocate 8.7% of total investment to gaging/inspection/testing equipment.

SIC	Industry	% of Total Capital Expenditures
341	Metal cans and shipping containers	10.6
346	Forgings and stampings	7.6
348	Ordnance and accessories, except vehicles and guided missiles	11.1
351	Engines and turbines	13.4
354	Metalworking machinery and equipment	9.1
357	Office, computing and accounting machines	13.7
361	Electrical transmission and distribution equipment	9.8
362	Electrical industrial apparatus	10.3
364	Electrical lighting and wiring equipment	9.1
366	Communications equipment	17.5
367	Electronic components and accessories	11.1
369	Miscellaneous electrical machinery, equipment and supplies	9.2
371	Motor vehicles, motor vehicle equipment	8.2
372	Aircraft and parts	12.4
381	Engineering, laboratory, scientific and research instruments and equipment	12.1
382	Measuring and controlling instruments	15.6
383	Optical instruments and lenses	13.9

SIC	Industry	% of Total Capital Expenditures
384	Surgical, medical and dental instruments and supplies	12.0
387	Watches, clocks, clockwork-operated devices, and parts	7.7

Plastic Molding Equipment

The average respondent company will allocate 3.4% of total investment to plastic molding equipment.

SIC	Industry	% of Total Capital Expenditures
253	Public library and related furniture	7.5
259	Miscellaneous furniture and fixtures	8.9
341	Metal cans and shipping containers	11.4
343	Heating equipment, except electric and warm air; and plumbing fixtures	5.5
347	Coating, engraving and allied services	3.7
349	Miscellaneous fabricated metal products	3.1
361	Electrical transmission and distribution equipment	9.4
362	Electrical industrial apparatus	4.9
363	Household appliances	13.0
364	Electrical lighting and wiring equipment	9.7
365	Radio and TV receiving equipment, except communications types	18.2
367	Electronic components and accessories	4.7
369	Miscellaneous electrical machinery, equipment and supplies	6.7
371	Motor vehicles, motor vehicle equipment	4.4
373	Ship and boat building and repairing	8.3
381	Engineering, laboratory, scientific and research instruments and equipment	4.0
382	Measuring and controlling instruments	6.2
384	Surgical, medical and dental instruments and supplies	8.8
385	Ophthalmic goods	10.0
386	Photographic equipment and supplies	10.9

Metalcutting Machine Tools

The average respondent company will allocate 33.7% of total investment to metalcutting machine tools.

SIC	Industry	% of Total Capital Expenditures
345	Screw machine products	53.3
348	Ordnance and accessories, except vehicles and guided missiles	38.5
349	Miscellaneous fabricated metal products	38.8
351	Engines and turbines	55.2
353	Construction, mining and material handling machinery and equipment	42.0
354	Metalworking machinery and equipment	66.0
355	Special industry machinery	56.0
356	General industrial machinery and equipment	48.7
359	Miscellaneous machinery and equipment	65.1
371	Motor vehicles, motor vehicle equipment	27.4
372	Aircraft and parts	50.9
376	Guided missiles, spare vehicles and parts	38.1
379	Miscellaneous transportation equipment	42.1
383	Optical instruments and lenses	33.3

Heat Processing Equipment

The average respondent company will allocate 1.4% of total investment to heat processing equipment.

SIC	Industry	% of Total Capital Expenditures
342	Cutlery, handtools, hardware	4.7
346	Metal forgings and stampings	1.9
347	Coating, engraving and allied services	2.4
348	Ordnance and accessories, except vehicles and guided missiles	1.5
362	Electrical industrial apparatus	1.6
364	Electrical lighting and wiring equipment	2.5
365	Radio and TV receiving equipment, except communication types	2.3
367	Electrical components and accessories	3.3
371	Motor vehicles, motor vehicle equipment	1.6
372	Aircraft and parts	3.2
374	Railroad equipment	2.9
376	Guided missiles, space vehicles and parts	3.8

Thank You: Then and Now

For those of you who filled out the forms that became the PRODUCTION 1988 Capital Spending Survey, we'd like to thank you—sort of. As you may recall, the stock market crash got in the way between the submission of the survey and the publication of the January 1988 issue of PRODUCTION. Consequently, we had the pre-crash numbers. Many economists said post-crash that capital spending would come to a grinding halt. But our conclusion was that investment in capital equipment was a careful, long-considered action, which wouldn't be too adversely affected by the temporary black hole on Wall Street.

So we went with what you said.

Actually, we were off: Only because you spent more than you told us you would.

As for those of you who contributed to these 1989 findings, we'd also like to extend our thanks. We recognize that it takes time and consideration to fill out the questionnaire. And that all of you, the men and women who make industry happen, are the best window into the future of durable goods manufacturing. We greatly appreciate your help. P

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